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ABSTRACT

Twenty-four sixth grade students participated in a study that adapted earlier reading research to determine whether students would demonstrate sensitivity to the presence or absence of a relevant schema in a passage and whether skilled readers would show more use of the schema than would less skilled readers. Six skilled and six less skilled readers read a passage in which information was presented in a schematically appropriate sequence, while the remaining six skilled and six less skilled students read a passage in which the same information was presented in a schematically inappropriate sequence. Findings indicated that (1) the subjects benefited from schematically relevant textual information, (2) no differential gain was exhibited as a function of reading ability, and (3) schematically relevant information was better encoded and better retrieved than schematically irrelevant information. (FL)

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SCHEMA UTILIZATION BY SKILLED AND LESS SKILLED SIXTH GRADE READERS

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The primary goal of schema theory is to describe the interaction between an incoming message and the schematic knowledge of the reader or listener. The assumption is not that meaning lies solely in the message or in the learner's mind, but rather that meaning can only be obtained through their active interaction. In other words, the reader's schematic knowledge functions as a cognitive filter through which to view the world and from which to predict or make inferences about what is read (Adams and Bruce, 1980; Anderson, 1977).

The importance of schema in reading comprehension has been established for adults, but little research has been conducted concerning children's ability to use background schemata to assist their comprehension. It is known that elementary school children do take advantage of their knowledge of well-formed stories in recalling orally presented narratives and that their ability to use story structure develops across the years from first to sixth grade (Stein & Glenn, 1977). Also, children's differentiation between important and unimportant information improves across these years (Smiley et. al., 1977). However, the passive orientation to text and integrative difficulties typical of poor readers (Bransford et. al., 1980; Golinkoff, 1976; Ryan, 1981) would suggest that they might not benefit as much (if at all) from the presence of schematic structure.

Poor readers have been found to be more text-dependent than good readers (Rumelhart, 1980), less able to utilize between-

sentence schemata, less sensitive to story components (Dickinson & Weaver, 1979), less discriminating between important and unimportant information, less able to detect errors at the discourse level, and less aware that the purpose of reading is the extraction of meaning (Canney and Winograd, 1979).

Anderson, Spiro and Anderson (1978) conducted a study on the use of schema in discourse processing which was later extended by Spiro and Tirre (1980). The Anderson et. al. data clearly suggested that college students' recall for story details was better when those details fit into an overall schema for the story than when no relevant schema was contained within the story. Anderson used two comparable passages with just enough word changes so that the first took place in a restaurant and the second took place in a grocery store. The restaurant passage depicted two individuals ordering food items in the schematically appropriate course sequence commonly associated with a restaurant (e.g., a beverage, a salad, a dinner entre). In contrast, the grocery store passage depicted individuals selecting food items in a schematically inappropriate fashion. Rather than the expected grocery sequence (e.g., dairy case, produce section, canned foods), the food items in the grocery passage were presented in the same course sequence as in the restaurant passage.

Anderson found the students in the restaurant condition recalled more food items correctly attributed to the person who had selected them than the students in the grocery condition. These data supported the facilitative effect schematic knowledge

has on the comprehension and retention of new information.

Based on the Anderson et. al. (1978) study, Spiro and Tirre (1980) hypothesized that college students' recall for schematically relevant information would differ as a function of their analytic style. Field independent individuals were expected to be more sensitive to and better able to utilize schematic knowledge while reading than field dependent readers. Indeed, a significant interaction between schema condition and analytic style was obtained. Only the field independent subjects in the restaurant condition experienced the facilitative effects of the schematically relevant information. Spiro and Tirre's (1980) results indicated that even among skilled college readers, individual differences exist in the utilization of schematic knowledge aiding passage recall.

Based on these studies, the present study was designed to address two key issues:

1. whether sixth graders demonstrate sensitivity to the presence or absence of a relevant schema

2. whether skilled readers would show more use of the relevant schema than less skilled readers.

The paradigm used in the two previously mentioned studies was used. We predicted that the Anderson et. al. (1978) finding of schema-dependent recall for details would be replicated with sixth graders. In addition, based on Spiro and Tirre's (1980) finding of important individual differences among college students in sensitivity to schema, we predicted that skilled readers would

use their schematic knowledge more to aid their reading comprehension than would less skilled readers. Given previous research on poor readers' lack of semantic integration skills and their passive approach to learning from text, it was uncertain whether they would be able to profit at all from the schematic structure.

Adapted versions of the restaurant and grocery passages employed by Anderson et. al. (1978) and later by Spiro and Tirre (1980) were used in this study. The new passages were written at a fourth grade readability level. The number of food items in each passage was reduced from the original 18 to 12, and were viewed as well within children's restaurant and grocery store experiences. These versions contained adolescent characters in school-related activities involving either a restaurant or a grocery store.

Method

The sixth graders were preselected for participation based on two days of pretest performance (n = 24). Children were given the comprehension subtest of the Stanford Diagnostic Reading Test (Form A, Brown Level) during the first session. Two days later, the children completed tests of nonverbal reasoning (Test of "g": Culture Fair, Scale 2, Form A), and a measure of field independence (Group Embedded Figures Test, Subtests 1 and 2). Skilled readers were defined as those children scoring in the ninth stanine of the Stanford Diagnostic Reading Comprehension subtest. Less skilled readers scored in the third stanine or below on the test.

Half of the skilled (n = 6) and half of the less skilled readers (n = 6) were assigned to the restaurant condition, with the remaining sixth graders (6 skilled and 6 less skilled readers) assigned to the grocery store condition. The four groups of skilled and less skilled readers were equated on nonverbal intelligence (IQ = 109) and field independence score (GEFT = 6.5). In addition, both skilled and less skilled reader groups were equated on reading ability.

Procedure

Two weeks after the original screening, the subjects were tested individually. They were instructed to read the assigned passage once, with an unlimited amount of time allowed to read the passage. Following a seven minute discussion with the examiner on an unrelated topic, the children were asked to recall the passage orally (free recall).

Free recall was followed by the examiner prompting specifically for the food items and who selected them (prompted oral recall). Thus, if one or both groups of sixth graders failed to profit from the schema in terms of their free recall scores, prompted recall scores could be examined to determine whether the schema did not facilitate storage of the information or whether selectivity in retrieval masked the difference between the schematically relevant and irrelevant passages in free recall. Besides this addition of prompted recall both a lenient and strict scoring procedure were employed. Leniently scored, the students correctly recalled the appropriate food items. Strictly scored, the student had to attribute food items to the correct person.

These new scoring procedures were expected to be better able to detect even limited use of schematic structure by the children, especially the less skilled readers.

Results

The strict and lenient recall scores were analyzed separately using a 2 (skilled vs. less skilled reader) X 2 (restaurant vs. grocery store) X 2 (free story recall vs. prompted list recall) mixed analysis of variance.

In the analysis of the more lenient scoring of food items, a main effect for reading, F (1,20) = 6.68 $p < .05$, indicated that the skilled readers recalled more food items than the less skilled readers. The mean recall of the four groups under the two recall formats are presented in Figure 1. The main effect for passage, F (1,20) = 4.47, $p < .05$, indicated that children assigned the restaurant passage recalled more food items correctly than those assigned the grocery store passage. The main effect obtained for recall format revealed that more food items were verbalized correctly when the children were prompted by questions than when freely recalling the entire story, F (1,20) = 10.04, $p < .01$. The predicted interaction between reader skill and passage was not significant, but the nearly significant three-way interaction of ability, passage type, and recall format, F (1,20) = 3,45, $p < .078$, appeared to suggest that the existence of the predicted interaction was affected by the recall format. To further examine this triple order interaction, separate reader x passage analyses of variance were performed on free and prompted recall of the food items.

Insert Figure 1 about here.

The analysis involving free recall of the food items yielded the main effects for reader, F (1,20) = 5.78, $p < .05$, and for passage, F (1,20) = 4.49, $p < .05$. As well, the interaction of reader skill with passage type approached significance ($p < .073$). Examination of the means revealed that this interaction was due to the superior recall of food items by the skilled readers in the restaurant condition in contrast to the remarkably similar performance by the other three groups. T-test comparisons showed that the skilled readers only performed better than the less skilled readers in the restaurant condition and that only the skilled readers benefitted from the appropriate restaurant schema.

A slightly different pattern of results was obtained in the analysis of prompted recall of the food items. This analysis revealed a significant main effect for reading ability, F, (1,20) = 5.50, $p < .05$, with skilled readers recalling more food items under prompted instruction than less skilled readers. Neither the main effect for passage nor the interaction between reading ability and passage reached significance, but the pattern of the means was essentially the same as for free recall.

The second main analysis was based on the free and prompted recall of food items attributed correctly to the person who had selected them. Again a main effect was obtained for reading ability, F (1,20) = 5.46, $p < .05$; for passage F (1,20) = 4.63, $p < .05$; and for recall F (1,20 = 8.29, $p < .01$ (see Figure 2 for means). These results indicate that skilled readers recalled

more food/person pairs than less skilled readers and that those children given the restaurant passage with a built-in schema recalled more than those given the grocery passage. Since none of the interactions was significant, the facilitative effect of the presence of schema was not different for this dependent measure for skilled vs. less skilled readers nor was the free recall format more sensitive to the schema effect.

Insert Figure 2 about here.

Discussion

In general, our data seem to support the facilitative effects of schematically relevant information on sixth graders' retention of details from simple stories. As can be seen in Figure 1, children reading the schematically appropriate restaurant passage recalled more food items in both free and prompted recall than those children reading the schematically inappropriate grocery passage. In addition, children's prompted recall for the food items was better than their free recall.

Although all four groups improved their recall performance of food items under prompting, only the less skilled readers given the schematically relevant restaurant passage and skilled readers given the schematically irrelevant grocery store passage significantly improved their recall under prompting. Despite similar performance by these two groups, the hypothesized reasons for their improvement are quite different. It was hypothesized that skilled readers' failure to include the food items in their

free recall may have been a stategic decision on their part - a realization that these food items were irrelevant details in the grocery store passage. In contrast, it was hypothesized that less skilled readers' failure to include the relevant details for the restaurant passage in their free recall represented one more example of their nonstrategic and passive approach to problem solving.

As can also be noted from the figures, less skilled readers were not able to perform as well as their more skilled peers, even though the readability level was well within the less skilled readers' grasp and recall was oral rather than written. Despite this lower recall performance by the less skilled readers, the prediction that skilled readers would exhibit greater use of the schematic structure provided by the restaurant condition received only a hint of support in the analysis for free recall of food items. Although only a marginally significant interaction, additional comparisons suggested that only the skilled readers in the schema-relevant condition differed from the other three groups (who did not differ) in free recall of food items. This pattern of means is very similar to those obtained by Spiro and Tirre for college students differing in analytic ability.

In contrast, the pattern of means obtained for prompted recall is somewhat different. Only a main effect for reading ability was obtained. It seems apparent in the prompted recall that the significant effect for schema vanished. The addition of this prompted recall measure evidently enabled less skilled readers in the restaurant condition and skilled readers in the grocery store

condition to demonstrate the actual story information encoded but not retrieved spontaneously.

A similar pattern of means was also obtained for free and prompted recall of food items attributed to the correct person. (See Figure 2) Schematically relevant textual information did facilitate recall performance for skilled and less skilled sixth graders.

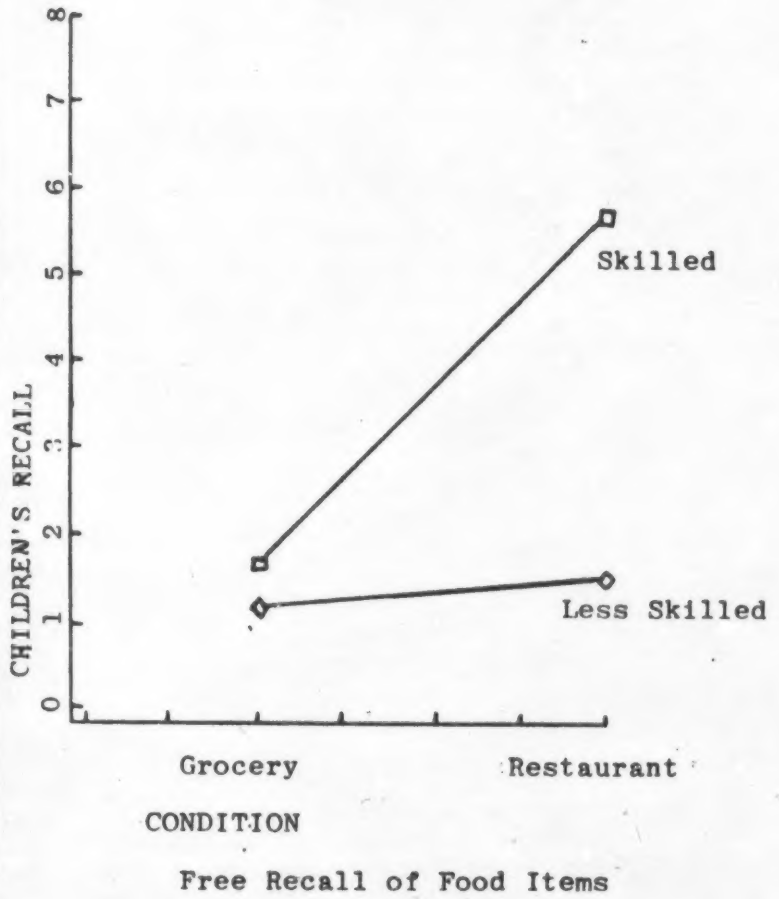
Taken altogether these data seem to suggest that:

1) readers as young as sixth grade benefit from schematically relevant textual information;

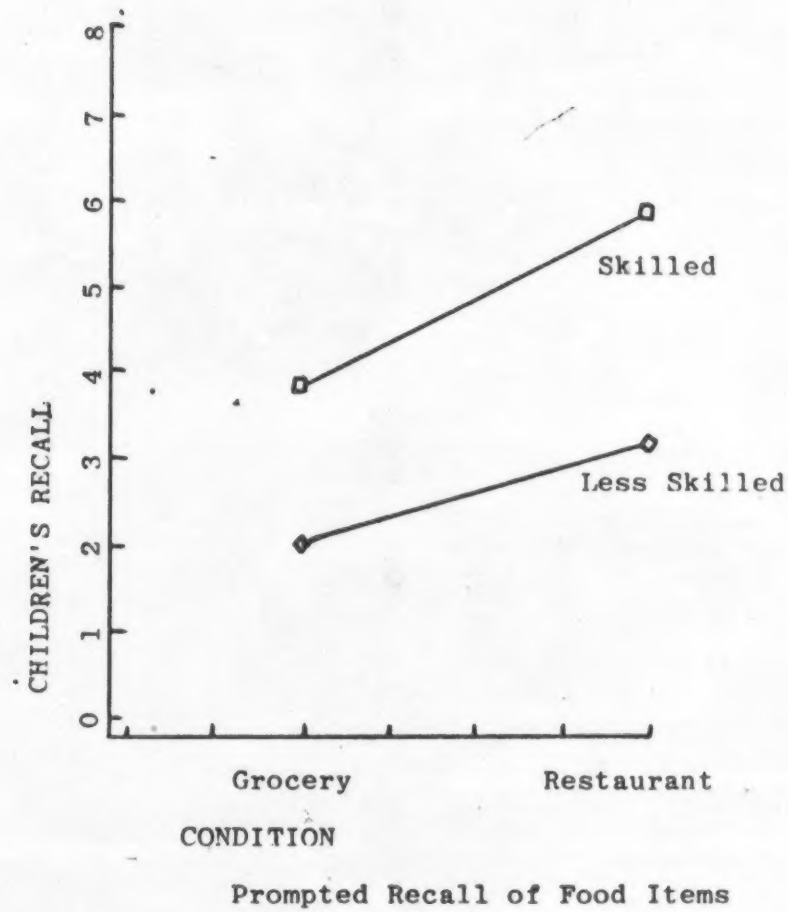
2) that no differential gain was exhibited as a function of reading ability;

3) that schematically relevant information is better encoded and better retrieved than schematically irrelevant information.

It should be further noted that this study clearly reveals the value of included both free and prompted recall measures in a study. It seems obvious that whereas in the case of the less skilled readers in the grocery condition free recall performance actually represents all the story information they encoded, the same is not true for the other children. Although no differences emerged in statistical comparisons between skilled and less skilled children in the grocery condition and the less skilled readers in the restaurant condition, it became clear in the prompted recall that the information the children spontaneously generated was not necessarily all that they had encoded.

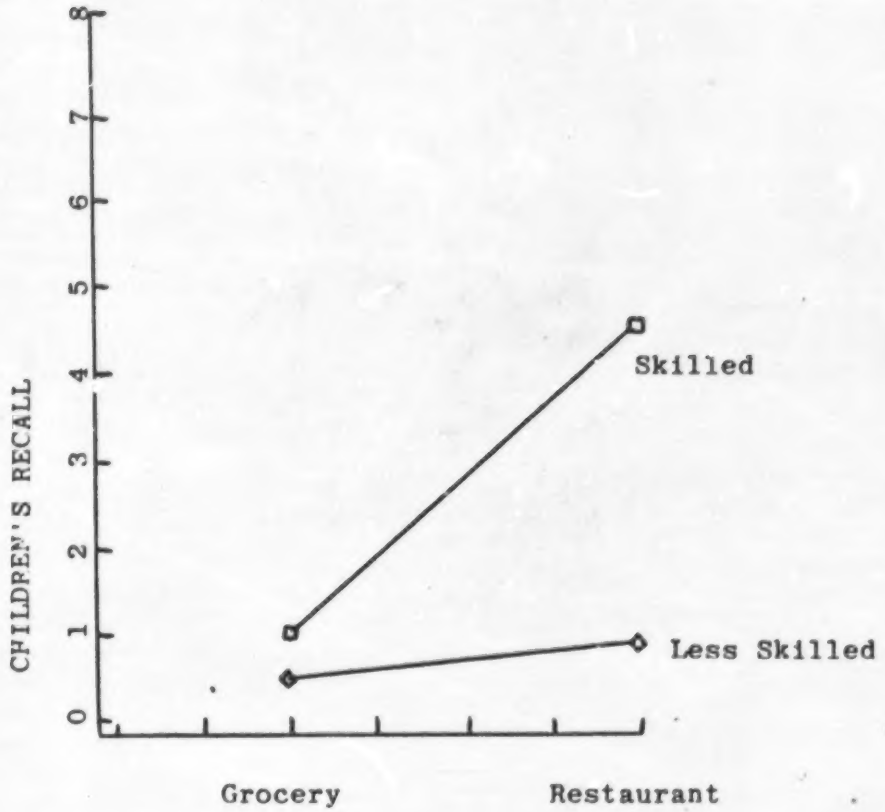


Free Recall of Food Items

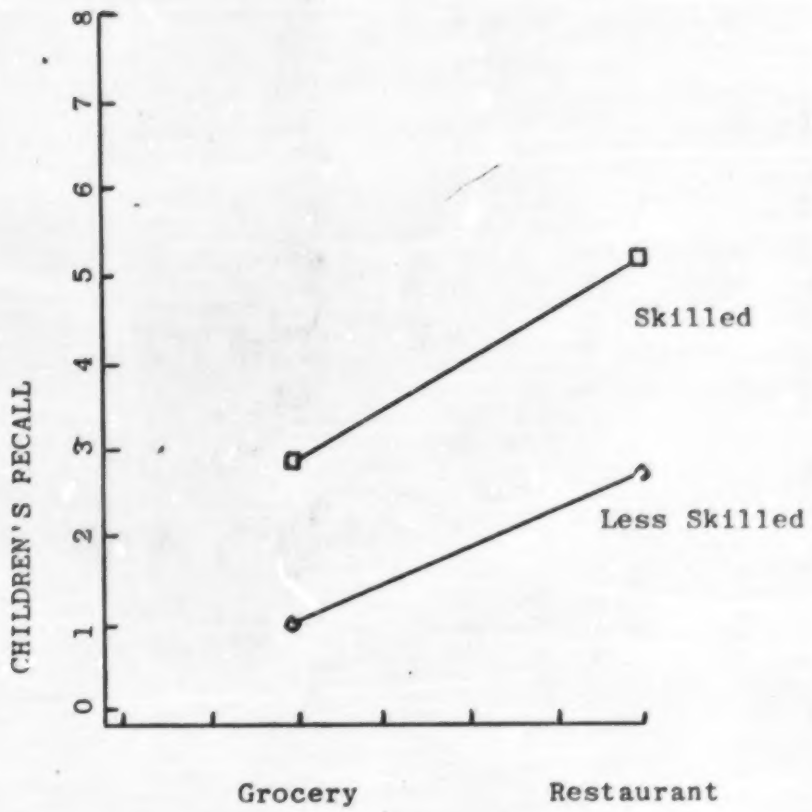


Prompted Recall of Food Items

Figure 1



Free Recall of Food Items
Attributed Correctly to a Person



Prompted Recall of Food Items
Attributed to the Correct Person

Figure 2

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